Conservation status of fishes in Hungary

By

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Abstract. The paper summarizes the conservation status of 75 fish species of Hungary. The evaluation of conservation status includes native, immigrant and introduced species. Two formulas are introduced for the calculation of the absolute and relative conservation value of species lists and for the qualification the ichthyofauna.

The evolution of the fish fauna in the Carpathian Basin was determined by the development of the primordial Danube and the climatic changes after the Pannonian Sea had receded. Since the end of the last century the fish fauna has changed significantly, some autochthonous species have become extremly rare, and some introduced species have become abundant. The main reasons for the decline of natural fish populations are: *a)* hydrological changes in the water systems: canalisation, regulation, dam construction, the drainage of swamps; *b)* pollution: industrial and municipal pollution, chemicals used in the agriculture, eutrophication, thermal pollution (the cooling water from electric power plants); *c)* fishery: excessive catches, poaching, the introduction of exotic species.

Most of the European freshwater fish species have high reproductive capacity still, the recruitment of the populations can permanently decrease if the suitable breeding and nursery habitats are restricted to small areas, spawning is difficult or the population is overfished. The distribution area of some native species is limited only habitats, which has not been affected by human impacts. The evaluation of the conservation status of fish species is an essential requirement for the prevention of the destruction of autochthonous fish communities in Hungary.

Classification of the conservation status

The evaluation of the conservation status of fish species is an important practical requirement and it demands a firm scientific basis. The assessment of rarity sometimes does not consider the ecological parameters of the populations, therefore

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it may be subjective and makes the choice of the appropriate protective measures uncertain. The list of the protected species changes from time to time, it usually expands when the habitats deteriorate.

The ichthyofauna of Hungary includes 78 species (PINTÉR, 1989), and 29 of them are protected by law. Their catches are completely prohibited (12/1993. [III.31.] KTM). Another 10 species have seasonal protection during the spawning period and their catches are prohibited under the appropriate legal size (4/1977. [XII.19.] MÉM). The Hungarian Red Data Book (RAKONCZAY, 1989) contains only 2 species of fish: *Umbra krameri* and *Barbus meridionalis petenyi*. This classification of the Hungarian fish fauna is not acceptable.

The first time, the rarity of the fish species in Hungary was assessed by PINTÉR (1987) on base of the faunistic literature. The categories of the evaluation were: common, less frequent, rare, quite rare and uncertain occurrence. The classification systems of threatened fishes usually follow the categories published by the International Union for the Conservation of Nature and Natural Resources in 1974 (LELEK, 1987; WILLIAMS and MILLER, 1990; SKELTON, 1990; WITKOWSKI, 1992), though it may rather be considered suitable better for terrestrial animals which can be counted in the field. The direct observations of fish populations are generally impossible and it is extremely difficult to prove the complete extinction of a species. Scattered records occasionally refer to the presence of rare species, which has not been seen in its former distribution area for years (LELEK, 1987).

The classification system adopted here has been based on the proposals of the IUCN (IUCN, 1990) with some modifications according to conditions specific to Hungary. The four threatened categories had been completed by three not threatened categories and all fish species of the Hungarian fauna have been classified (GUTI, 1993). The first five categories involve native species, which bred in the Carpathian Basin in the 19th century or have appeared by natural invasion. The sixth category includes the immigrant species and the seventh category involve the introduced species. The conservation status of the categories have been qualified by relative values. The categories of the species are defined as follows:

1. *Extinct (Ex)*: the species is extinct from natural waters, though it was present in the last centuries and have not been recorded within the last 50 years. — *No relative value.*

2. *Endangered (E)*: the species is immediately threatened, it occurs only in one or just a reduced number of localities, its population size has dropped to a critical level. They will not survive if the present factors continue to affect them. — *Relative value: 4.*

3. *Vulnerable (V)*: the species is rare and very sensitive to environmental changes, its abundance is decreasing in the localities, which are being affected and destroyed by human impacts. They will be endangered if the unfavourable factors continue to affect them. — *Relative value: 3.*

4. *Rare (R)*: a species in low abundance in small localities, but it has permanently been present in suitable habitats or a species which is rare today, as its formerly large distribution areas have been reduced to a few suitable biotopes. — *Relative value: 2.*

5. *Abundant (A)*: a native species which is not threatened. It usually occurs in large populations and it is more resistant to human impacts. — *Relative value: 1.*

6. *Immigrant (Im)*: occasionally found European species, which immigrate, but their populations have not had a natural recruitment in Hungary. — *No relative value.*

7.	*Introduced (In)*: exotic species introduced to the Carpathian Basin after the 19th century. — *Relative value: 0.*

In the Carpathian Basin there is only one endemic species, *Eudontomyzon danfordi*, but the natural distribution area of ten other species are restricted for the catchment area of the Danube. The relative conservation value of the Danubian endemic species (*) is enhanced with one additional unit.

Table 1. List of the Hungarian ichthyofauna.

I. protected by law (+ seasonally, ++ completely); II. conservation status: E = endangered, V = vulnerable, R = rare, A = abundant, Im = immigrant, In = introduced, *endemic) III. relative value

	I.	II.	III.
Petromyzontidae:			
Eudontomyzon danfordi Regan, 1911	++	E*	5
Eudontomyzon mariae (Berg, 1931)	++	E	4
Acipenseridae:			
Huso huso (Linné, 1758)	++	E	4
Acipenser güldenstaedti colchicus Marti, 1940	++	E	4
Acipenser nudiventris Lovetzky, 1828	++	E	4
Acipenser stellatus Pallas,1811	++	E	4
Acipenser ruthenus Linné, 1758	+	R	2
Clupeidae:			
Alosa pontica pontica (Eichwald, 1833)		Im	-
Salmonidae:			
Salmo trutta m. fario Linné, 1758	+	R	2
Oncorhyncus mykiss (Walbaum, 1792)	+	In	0
Salvelinus fontinalis (Mitchill, 1815)		In	0
Hucho hucho (Linné, 1758)	++	E*	5
Coregonidae:			
Coregonus lavaretus (Linné, 1758)		Im	-
Coregonus albula Linné, 1758		Im	-
Thymallidae:			
Thymallus thymallus (Linné, 1758)	++	Im	-
Umbridae:			
Umbra krameri Walbaum, 1792	++	V*	4
Esocidae:			
Esox lucius Linné, 1758	+	A	1
Cyprinidae:			
Rutilus rutilus (Linné, 1758)		A	1
Rutilus pigus virgo (Heckel, 1852)		V*	4
Pararutilus frisii meidingeri (Heckel, 1852)		?	-
Ctenopharyngodon idella (Valenciennes, 1844)		In	0
Scardinius erythrophthalmus (Linné, 1758)		A	1
Leuciscus leuciscus (Linné, 1758)		R	2
Leuciscus cephalus (Linné, 1758)		A	1
Leuciscus idus (Linné, 1758)		R	2
Leuciscus souffia agassizi Cuvier et Valenciennes, 1844	++	?	-
Phoxinus phoxinus (Linné, 1758)	++	V	3
Aspius aspius (Linné, 1758)	+	R	2
Leucaspius delineatus (Heckel, 1843)	++	V	3
Alburnus alburnus (Linné, 1758)		A	1

Alburnoides bipunctatus (Bloch, 1782)	++	V	3
Chalcalburnus chalcoides mento (Agassiz, 1832)	++	E*	5
Blicca bjoerkna (Linné, 1758)		A	1
Abramis brama (Linné, 1758)		A	1
Abramis ballerus (Linné, 1758)		R	2
Abramis sapa (Pallas, 1811)		R	2
Vimba vimba (Linné, 1758)		V	3
Pelecus cultratus (Linné, 1758)		R	2
Tinca tinca (Linné, 1758)		R	2
Chondrostoma nasus (Linné, 1758)		R	2
Barbus barbus (Linné, 1758)	+	A	1
Barbus meridionalis petényi Heckel, 1847	++	V	3
Gobio gobio (Linné, 1758)		A	1
Gobio albipinnatus vladykovi Fang, 1943	++	R	2
Gobio uranoscopus (Agassiz, 1828)	++	E*	5
Gobio kessleri Dybowski, 1862	++	V*	4
Pseudorasbora parva (Schlegel, 1842)		In	0
Rhodeus sericeus amarus (Bloch, 1843)		A	1
Carassius carassius Linné, 1758		R	2
Carassius auratus Linné, 1758		A	1
Cyprinus carpio Linné, 1758	+	A	1
Hypophtalmichthys molitrix (Valenciennes, 1844)		In	0
Aristichthys nobilis (Richardson, 1845)		In	0
Cobitidae:			
Neomacheilus barbatulus (Linné, 1758)	++	R	2
Misgurnus fossilis (Linné, 1758)	++	R	2
Cobitis taenia Linné, 1758	++	R	2
Cobitis (Sabanejewia) aurata (Filippi, 1865)	++	V	3
Siluridae:			
Silurus glanis Linné, 1758	+	R	2
Ictaluridae:			
Ictalurus nebulosus (Le Seur, 1819)		In	0
Ictalurus melas (Rafinesque, 1820)		In	0
Anguillidae:			
Anguilla anguilla (Linné, 1758)		Im	-
Gadidae:			
Lota lota (Linné, 1758)		V	3
Gasterosteidae:			
Gasterosteus aculeatus Linné, 1758		In	0
Poecilidae:			
Gambusia affinis holbrooki Girard, 1859		In	0
Centrarchidae:			
Lepomis gibbosus (Linné, 1758)		In	0
Micropterus salmoides (LacépŐde, 1802)		In	0
Percidae:			
Perca fluviatilis Linné, 1758		A	1
Gymnocephalus cernuus (Linné, 1758)		A	1
Gymnocephalus baloni Hocik et Hensel, 1974	++	R*	3
Gymnocephalus schraetzer (Linné, 1758)	++	V*	4
Stizostedion lucioperca (Linné, 1758)	+	R	2
Stizostedion volgense (Gmelin, 1788)	+	V	3
Zingel zingel (Linné, 1758)	++	V*	4
Zingel streber (Siebold, 1863)	++	V*	4
Gobiidae:			
Proterorhinus marmoratus (Pallas, 1811)		R	2
Neogobius fluviatilis (Pallas, 1811)	++	R	2
Cottidae:			
Cottus gobio Linné, 1758	++	V	3
Cottus poecilopus Heckel, 1836	++	?	

The presented faunal list of fishes in Hungary (Table 1) was edited by PINTÉR, (1989). The list includes 78 species without the occasionally found exotic species. It involves 3 species (*Pararutilus frisii meidingeri, Leuciscus souffia agassizi, Cottus poecilopus*) which have not been documented within the border of Hungary, these species were excluded from the evaluation. According to the classification, 45 species are threatened (E, V, R: 60.0%), 13 native species are not threatened (A: 17.3%), 5 species are immigrant (Im: 6.7%) and 12 species are introduced (In: 16.0%). There is no extinct fish species in the Hungarian fauna, but the extinction of *Acipenser stellatus* may be supposed, its last specimen was caught from the Danube at Mohács in 1965 (PINTÉR, 1991).

Qualification of ichthyofauna

The qualification of species lists can simply be done by using the conservation values. The conservation values of the fauna are defined as follows: The absolute conservation value of the fauna (CV_a) is the sum of the relative conservation values of the native species and the number of the endemic species.

$$CV_a = 4n_E + 3n_V + 2n_R + n_A + 0n_{In} + n^*$$

where n_E is the number of endangered species, n_V is the number of vulnerable species, n_R is the number of rare species, n_A is the number of abundant species, n_{In} is the number of introduced species (their relative conservation value is 0!), n^* is the number of endemic species.

The relative conservation value of the fauna (CV_r) is the quotient of the absolute conservation value of the fauna and the number of the evaluated species.

$$CV_r = \frac{CV_a}{n_E + n_V + n_R + n_A + n_{In}}$$

The absolute conservation value of the fauna represents the quantity of the threatened and native species, while the relative conservation value of the fauna represents their proportion. The conservation values make the temporal and spatial analysis of species lists possible, which is a suitable method for the evaluation of human impacts on fishes.

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